

# EDIBLE MARS ROVER

## Adapted from Jean Settle's "Edible Rockets"

### **Introduction:**

In 1997, NASA used small robotic vehicles to explore Mars. The *Sojourner* rover was able to roll around the surface of Mars recording data about rocks at the landing site and taking close-up pictures of Martian surface features. The *Sojourner* rover never traveled more than a few tens of meters away from the *Pathfinder* lander. A new, larger rover is being developed for a possible Mars sample return mission. This long-range rover will help to kick-off a new era of exploration of the Red Planet. The long-range rovers will be collecting Mars rocks and soil to be returned to Earth. A prototype of this rover is called *FIDO* (*Field Integrated Design and Operations*). *FIDO* is being tested on Earth first. High school and middle school students were part of the *FIDO* team that helped to run the field tests in the Mojave Desert during the spring of 1999 and 2000. This activity will help to familiarize students with planetary rovers.

### **Grade level:**

4<sup>th</sup> to 9<sup>th</sup> - Can be adjusted to other class levels

### **Objectives:**

- Students will be able to identify the instrumentation aboard the *FIDO* & *Athena Long-Range Rover*
- Students will use creative thinking and problem solving skills to design the *FIDO* or *Athena Rover* using a supply of different foods.
- Students can create and explain the instrumentation on their own rover

### **National Science Education Standards:**

Standard E: Abilities of technological design

### **National Technology Education Standards:**

NT.K-12.5 Technology Research Tools

### **Suggested Materials (per student team):**

3 graham crackers	1 roll of Smarties
6 creme wafer cookies	3 large marshmallows
1 snack-size Kit Kat	1 straw
1 Peppermint Patty	1 plastic knife
6 Rolos	7 toothpicks
8 gumdrops	1 sheet of 18" x 12" wax paper

### **Materials for a class of 25:**

scissors  
 4 containers of frosting  
 paper towels  
 sturdy paper plates  
 25 copies of *Athena Rover* handouts

**Supplies Suggestion:**

The materials for this activity can be divided up for student (or parent volunteers) to supply. Another way to offset cost of this activity is to plan it after a major holiday when candy is on sale or closeout (Halloween, Easter, etc.)

**Procedure:**

To begin the lesson, introduce students to the different rovers. After finishing discussion, pass out above materials. The students need to decide which rover (Sojourner, FIDO, or their own design) they will construct with the materials provided. To minimize messiness students should use the wax paper surface. Frosting can be distributed by placing a spoonful on each students' sheet of wax paper. Frosting can be used to "glue" pieces together. Also, have an adult or student monitor the amount of candy each student takes. Encourage a small amount at first, with more available as the rover design is developed. The basic components can be pre-bagged in a plastic baggie ahead of time if desired. If multiple periods are doing this activity (middle school), only put out supplies for one period at a time to prevent shortages later in the day.

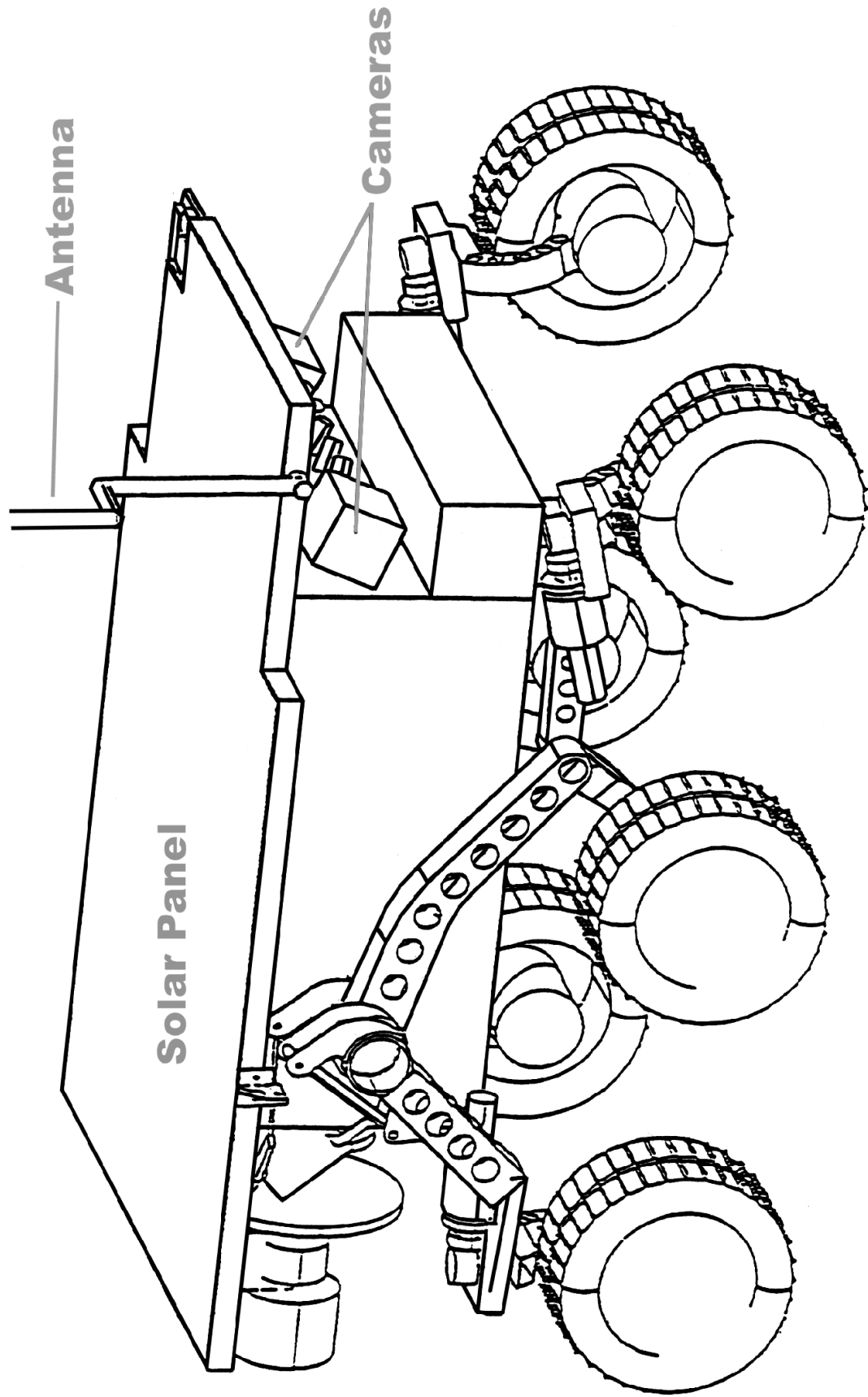
**Suggestions:**

- Encourage students to use given materials to design the rover.
- Allow students to design their spacecraft independently within their group. The final design to be constructed should be a group decision or a compilation of multiple designs. This activity is designed to facilitate creative thinking. There are no right or wrong answers.
- To reduce cost of supplies try the following:
- Assign each student to bring a different food item.
- Ask your PTO or Home School Association to provide funding for the activity.
- Have an adult or student monitor the amount of candy each student takes. Encourage a small amount at first, with more available as the rover design is developed.
- The basic components can be pre-bagged in a plastic baggie ahead of time if desired.
- If multiple periods are doing this activity (middle school), only put out supplies for one period at a time to prevent shortages later in the day.
- This activity can be done individually if enough materials can be supplied

**Assessment:**

Students display and discuss their models. After completion, have students discuss strategies they used to design their rover and its capabilities. This will allow them to share their problem solving and design strategies. Ask students how this activity helped them learn more about the technology and exploration strategies for NASA's missions to Mars.

# Mars Pathfinder Rover



# **EDIBLE MARS SPACECRAFT**

## **Adapted from Jean Settle's "Edible Rockets"**

### **Introduction:**

In 1996 two spacecraft, *Mars Global Surveyor* and *Mars Pathfinder*, were launched to Mars. These spacecraft kicked off a decade long, exploration of the *Red Planet*. The exploration continues with Mars spacecraft being launched every 26 months. Through this activity, students will become familiar with the missions and the type of equipment on board each spacecraft or create their own designs!

### **Grade level:**

1-8, adjust to meet class needs

### **Objectives:**

- Students will be able to identify two Mars spacecraft
  - a) *Mars Global Surveyor*
  - b) *Mars Pathfinder* and the rover, *Sojourner*
- Students will use creative thinking and problem solving skills to design either one or both of the above spacecraft using a supply of different foods.

### **National Science Education Standards:**

Standard E: Abilities of technological design

### **National Technology Education Standards:**

NT.K-12.5 Technology Research Tools

### **Suggested Materials (per student team / other materials can be freely substituted):**

- 3 graham crackers
- 1 roll of *Smarties*
- 6 creme wafer cookies (solar panels)
- 3 large marshmallows
- 1 snack-size *Kit Kat*
- 1 straw
- 1 Peppermint Patty
- 1 plastic knife
- 6 *Rolos* candies or *Reeses Peanut Butter Cups* (wheels)
- 7 toothpicks
- 8 gumdrops
- 1 sheet of 4" x 4" wax paper for icing
- 1 sturdy paper plate or cardboard sheet for building platform

**Materials for a class of 25:**

- scissors
- 4 containers of frosting
- paper towels
- 25 copies of Mars Global Surveyor, Mars Pathfinder, and/or Sojourner handouts

**Procedure:**

To begin the lesson, introduce students to the different Mars spacecrafts. After finishing discussion, pass out above materials. The students need to decide which spacecraft they will construct with the materials provided. To minimize messiness students should use the wax paper surface. Frosting can be distributed by placing a spoonful on each student's sheet of wax paper. Frosting can be used to “glue” pieces together.

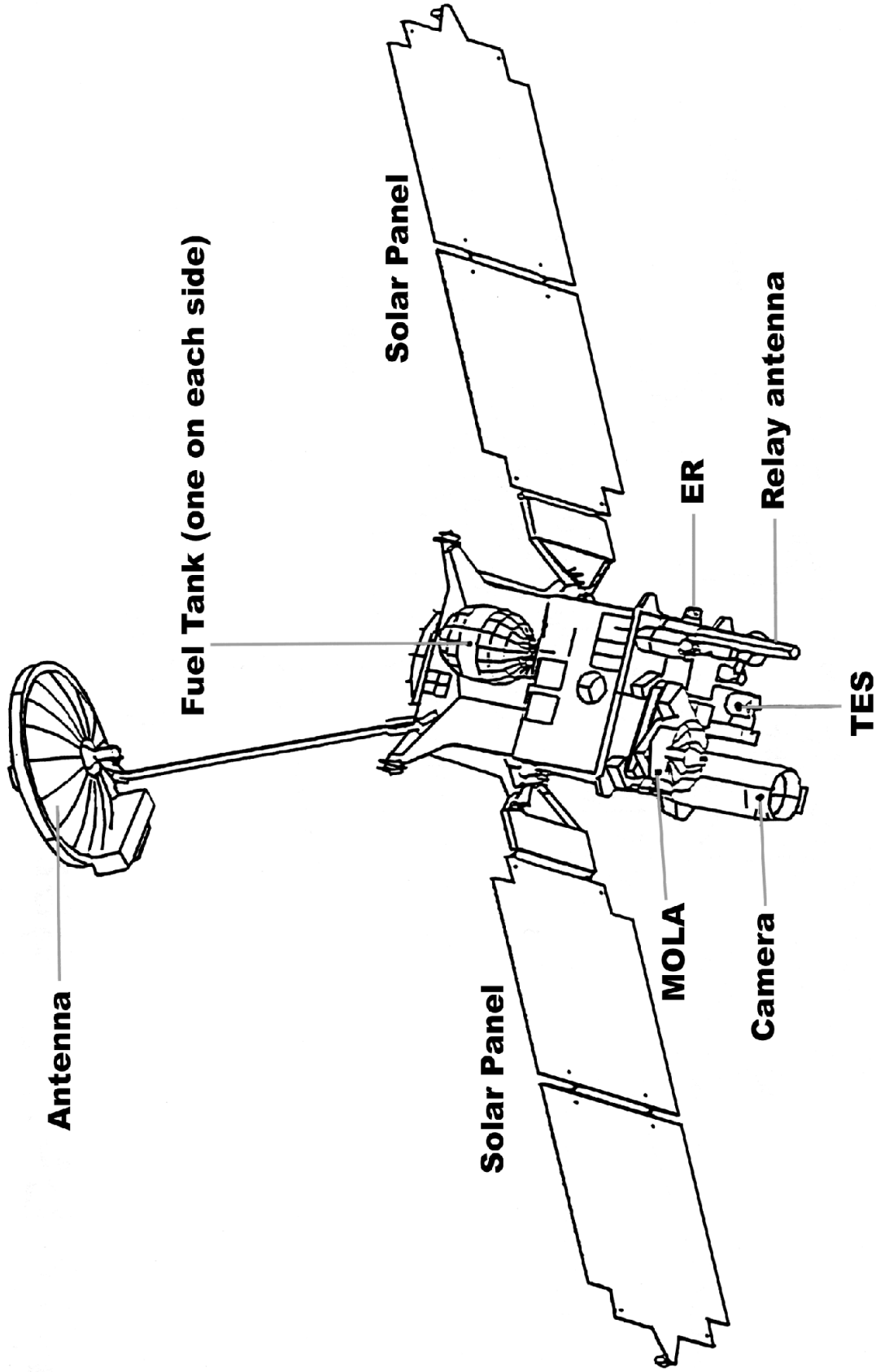
**Assessment:**

Students display and discuss their models. After completion, have students discuss strategies they used to design their spacecraft. This will allow them to share their problem-solving strategies. Ask students how this activity helped them learn more about the missions to Mars.

**Suggestions:**

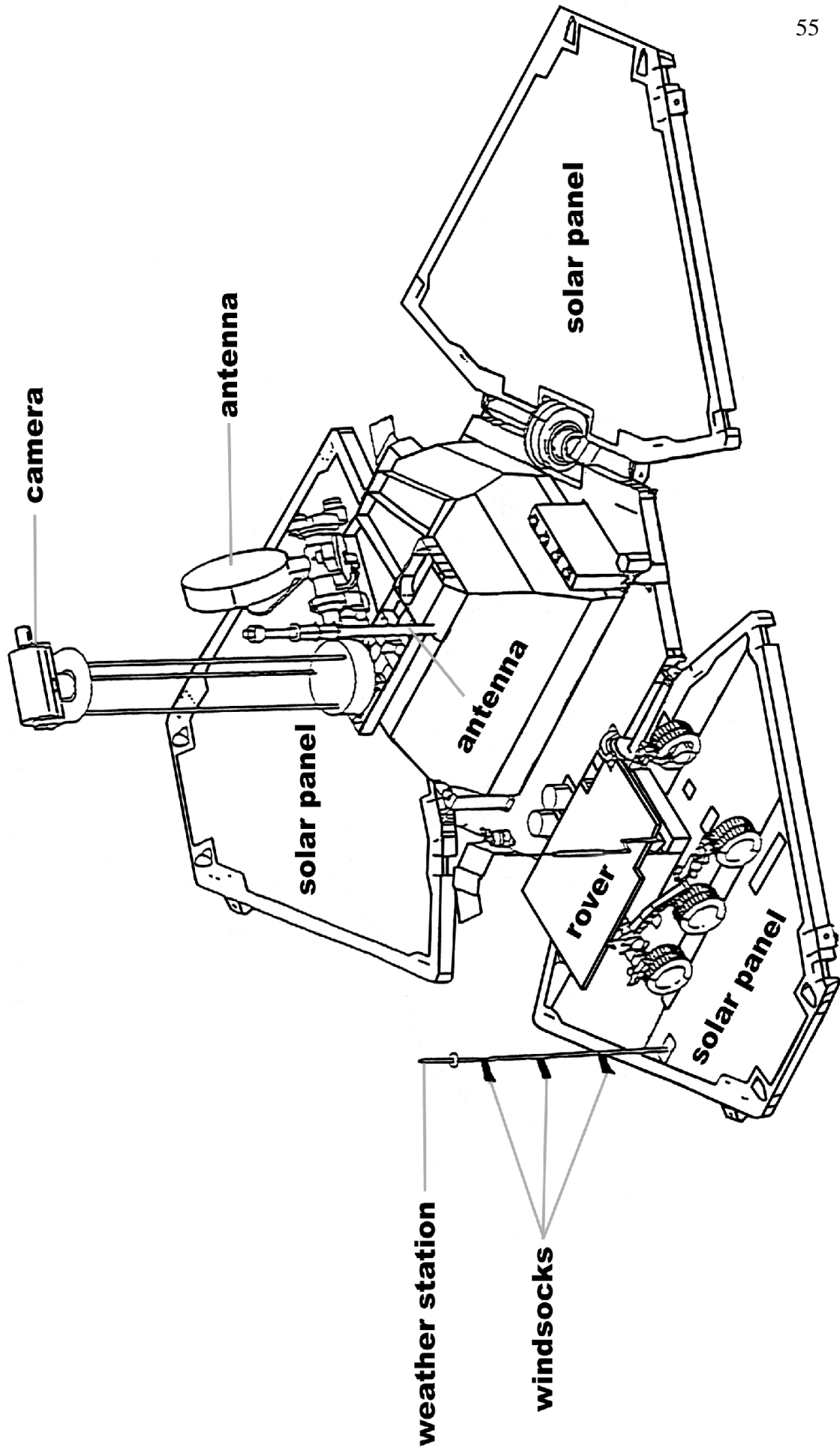
- Encourage students to use given materials to design all spacecraft and the rover,
- Have an adult or student assigned to the material table to oversee distribution of materials. Allow students to take a minimum of materials and return for additional materials to cut down on excessive materials being taken;
- Allow students to design their spacecraft independently if they wish. This activity is designed to facilitate creative thinking. There are no right or wrong answers; and
- To reduce cost of supplies try the following:
  - Purchase or get candy donated after major holiday.
  - Assign each student to bring a different food item.
  - Ask your PTO or Home School Association to provide funding for the activity.
  - Use cooperative learning and have one group of 3-4 students design all spacecraft with one set of materials.

# MARS GLOBAL SURVEYOR



TES: Thermal Emission Spectrometer, used to analyze rocks  
ER: Electron Reflectometer, used to measure magnetism  
MOLA: Mars Orbiter Laser Altimeter, used to measure elevations

# Mars Pathfinder



# Mars Pathfinder Rover

